## 6.3: Future Values of Annuities

## Definition.

- An **annuity** is a financial plan characterized by regular payments (e.g. mortgages, student loans, etc.).
- The sum of all the payments and the interest earned is called the **future value** of the annuity or its future value.
- An **ordinary annuity** or (**annuity immediate**) is an annuity in which payments are made at the *end of each of the equal payment intervals*.

**Example.** Suppose that we invest \$100 at the end of each year for 5 years in an account that pays 10% compounded annually. How much money will you have at the end of the 5 years?

## Definition.

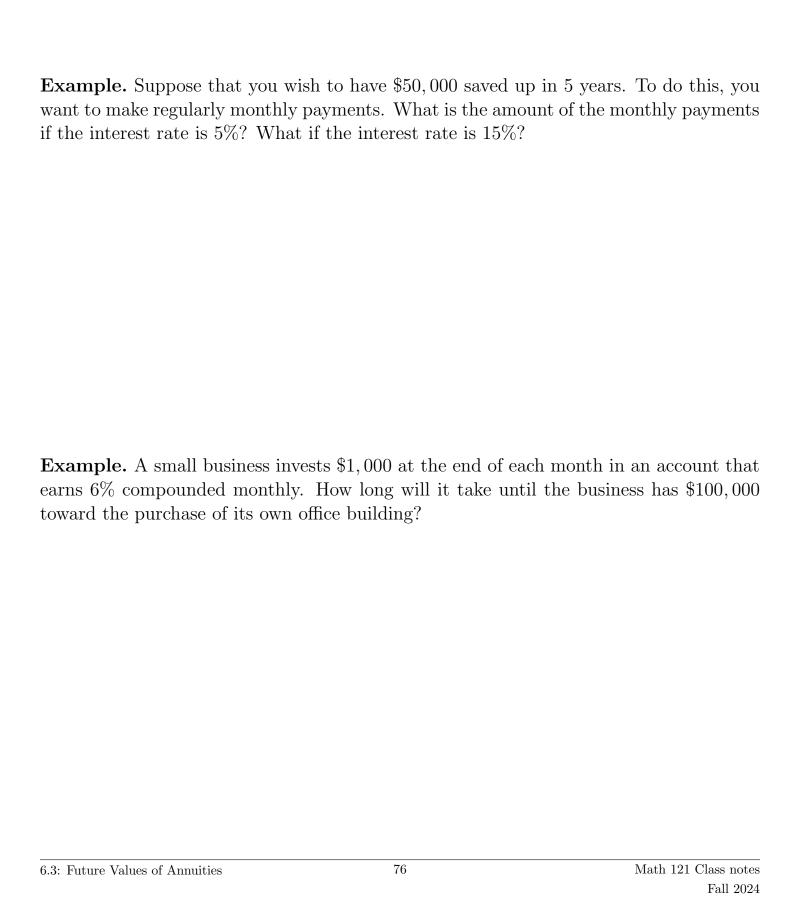
If R is deposited at the end of each period for n periods in an annuity that earns interest at a rate of i per period, the **future value of the annuity** will be

$$S = R \cdot S_{\overline{n}|i} = R \left\lceil \frac{(1+i)^n - 1}{i} \right\rceil$$

The notation  $S_{\overline{n}|i}$  represents the future value of an ordinary annuity of \$1 per period for n periods with an interest rate of i per period.

regula	nple. Suppose a pair of twins arly make investments of \$2,000 and at age 21:		
	Find the future value if twin a investment accrue compound i		
	Find the future value if twin lathe following 36 years.	B waits 8 years before maki	ng regular payments for
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## Definition.

An **annuity due** differs from an ordinary annuity in that the payments are made at the *beginning of each period*.

If R is deposited at the beginning of each period for n periods in an annuity that earns interest at a rate of i per period, the **future value of the annuity** will be

$$S_{\text{due}} = R \cdot S_{\overline{n}|i}(1+i) = R \left[ \frac{(1+i)^n - 1}{i} \right] (1+i)$$

**Example.** Find the future value of an investment if \$150 is deposited at the beginning of each month for 9 years at an interest rate of 7.2% compounded monthly.

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